

Signature: Steve Walker

Robert E. Haines
Mark A. Harper

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**REORDER ASSISTANCE NOTIFICATION OF NEAR END-OF-LIFE
CONSUMABLES AND METHOD**

FIELD OF THE INVENTION

The invention relates to printers and other hard copy output engines. More particularly, the invention relates to a consumables/printer management system providing indications of future needs in conjunction with indications of present needs.

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BACKGROUND OF THE INVENTION

As computer systems and data communications systems have developed, the number and variety of hard copy output engines employed in a typical office or factory setting has grown. Examples include photo copiers, facsimile machines, printers and devices including more than one of these capabilities. In turn, this has led to a need to be able to order greater amounts of consumable supplies, some of which are specific to specific types of hard copy output engines.

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As need for these types of hard copy output engines has grown, a number of different manufacturers have developed different hard copy output engines providing different operational characteristics and capabilities. While some consumable commodities associated with these devices are common to most or all such devices (e.g., standardized paper sizes), other consumable commodities, such as toners and toner supply cartridges or ink reservoirs, tend to be unique to a specific manufacturer and may be unique to a specific product line from that manufacturer. Additionally, different hard copy output engines may have different paper capacities, capabilities for accepting more or fewer paper sizes and different toner or other pigment supply requirements and capacities. Further, as hard copy output engines have been developed to provide increasing capabilities, the number of different consumable supplies utilized by the hard copy output engines has grown.

For example, hard copy output engines capable of processing jobs requiring different paper sizes need to be stocked with more than one kind or size of paper. Additionally, color printers require multiple pigmentation sources, which may be multiple ink reservoirs for liquid or solid inks, or may be multiple toners representing different primary colors.

It is generally helpful to have a mechanism for scheduling and tracking orders of consumable commodities and/or service in keeping computer systems functional. For example, it is extremely helpful to ensure that adequate supplies of replacement paper and toner or ink are available when needed.

Coordination of orders for supplies can be very helpful to avoid over- or under-stocking of these consumable commodities, while still achieving the benefits of economies of scale by pooling orders to service multiple hard copy output engines, especially those using at least some of the same consumable commodities. However, in many business settings, the sheer number of diverse hard copy output engines being used in different aspects or divisions of the business may lead to confusion in maintaining adequate supplies of these consumable commodities and in scheduling replacement of consumable commodities as well as scheduling preventative maintenance.

What is needed is a way to facilitate scheduling replacement of consumable commodities, as well as scheduling preventative maintenance, for one or more hard copy output engines that are included in a network.

SUMMARY OF THE INVENTION

In accordance with an aspect of the present invention, a method of scheduling an event with respect to a hard copy output engine includes detecting a first status of a first portion of the hard copy output engine from a first sensor incorporated in the hard copy output engine and detecting a second status of a second portion of the hard copy output engine from a second sensor incorporated in the hard copy output engine. The method also includes composing an electronic message including the detected first and second status and transmitting the electronic message.

In accordance with another aspect of the present invention, an article of manufacture includes a computer usable medium having computer readable code embodied therein. The computer readable code is configured to cause a processor to detect a first status of a first portion of the hard copy output engine from a first sensor incorporated in the hard copy output engine and to detect a second status of a second portion of the hard copy output engine from a second sensor incorporated in the hard copy output engine. The computer readable code is also configured to cause a processor to compose an electronic message including the detected first and second status and transmit the electronic message.

In accordance with yet another aspect of the present invention, a computer implemented control system for a hard copy output engine includes a first sensor coupled to a first portion of the hard copy output engine. The first sensor is configured to provide a first status of the first portion. The computer implemented control system also includes a second sensor coupled to a second portion of the hard copy output engine. The second sensor is configured to provide a second status of the second portion. The computer implemented control system also includes processing circuitry coupled to the first and second sensors and configured to detect the first status and detect the second status. The processing circuitry is further configured to compose an electronic message including the detected first and second status and transmit the electronic message.

Other features and advantages of the invention will become apparent to those of ordinary skill in the art upon review of the following detailed description, claims and drawings.

DESCRIPTION OF THE DRAWINGS

Fig. 1 is a simplified block diagram of a computer network including a computer and a hard copy output engine, in accordance with an embodiment of the present invention.

Fig. 2 is a simplified block diagram of a computer network including multiple hard copy output engines, in accordance with an embodiment of the present invention.

Fig. 3 is a simplified flowchart illustrating a process, in accordance
5 with an embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Fig. 1 is a simplified block diagram of a computer network 10 including a computer 12 having a floppy disc drive 13. The network 10 also includes a hard copy output engine 14, in accordance with an embodiment of the present invention. The hard copy output engine 14 includes a controller 15, such as a conventional microprocessor or microcontroller. The hard copy output engine 14 also includes a memory 16 in data communication with the controller 15 and two or more sensors 17 coupled to the controller 15. The memory 16 is configured to embody computer readable code for configuring the processor 15 to carry out various operations and may include an electrically alterable read only memory (EAROM), electrically programmable read only memory (EPROM), a write-once, read-many memory (WORM), magnetic, magneto-optic or optical storage media, such as conventional disc storage or floppy disc data storage units, or CD-ROMs or the like, and may include read/write memory such as DRAMs or SRAMs.

The computer 12 is coupled to the hard copy output engine 14 via a data path such as a bus 20 allowing either the computer 12 or the hard copy output engine 14 to initiate data communications with the other. In one embodiment, the hard copy output engine 14 is a device such as a printer, copier, facsimile machine, or a multifunction device capable of providing two or more such functions. In one embodiment, the system 10 is coupled to other external devices (not shown in Fig. 1) via the bus 20.

In one embodiment, the bus 20 includes an intranet. In one embodiment, the bus 20 includes a local area network (LAN) or wide area network (WAN). In one embodiment, the bus 20 includes access to the

Internet. In one embodiment, the computer 12 and the hard copy output engine 14 are capable of exchanging data via a protocol compatible with presence of other computers 12 or hard copy output engines 14 on the bus 20. In one embodiment, the computer 12 and the hard copy output engine 14
5 employ an object-oriented request-reply protocol supporting asynchronous printer query, control and monitor capabilities, and that is capable of documenting the requests, replies and data types supported by the protocol.

In one embodiment, the bus 20 provides common gateway interface (CGI) data communication capability. In one embodiment, the bus 20 includes
10 an email capability (e.g., simple mail transfer protocol or SMTP) for facilitating data communication. In one embodiment, the bus 20 includes a secure data path using HTTP (hyper text transfer protocol) with SSL (secure sockets layer), as is described in more detail in U.S. Patent No. 5,657,390, entitled "Secure Socket Layer Application Program Apparatus And Method", issued to Elgamal et
15 al. and U.S. Patent No. 6,081,900, entitled "Secure Intranet Access" and issued to Subramanian et al., which patents are hereby incorporated herein by reference for their teachings.

The sensors 17 are coupled to consumable commodities associated with the hard copy output engine 14. In one embodiment, when the sensors 17
20 report that a quantity of a consumable commodity (e.g., paper, toner or ink) associated with the hard copy output engine 14 has decreased to below a predetermined threshold amount, or that malfunction of a dispenser of a consumable commodity exists, the controller 15 initiates a data communication ultimately intended for transmission via the data path 20, as is described below
25 in more detail with reference to Fig. 3. Alternatively or additionally, the sensors 17 may log hours of operation and/or loading (such as number of pages handled) in order to determine when preventive maintenance is appropriate, or may report other malfunction of the hard copy output engine 14.

Fig. 2 is a simplified block diagram of a computer network or
30 system 25 including multiple hard copy output engines 14, in accordance with an embodiment of the present invention. The network 25 of Fig. 2 includes a

link 32, which may include a firewall 34, to other networks 36, which may be internal or external. The network 25 also may include print clients 40, such as Microsoft 42 and/or Unix 44, as well as others. The network 25 may further include print spoolers 46, such as NT 48, Unix 50 and/or Netware 52, as well as others. The network 25 may also include a plurality of hard copy output engines 14, which may include printers as well as a facsimile/copier 60.

In one embodiment, the print clients 40 and the print spoolers 46 are coupled via the bus 20 to other data processing equipment (not shown), where the bus 20 is configured for data communication using HTTP, although other protocols may be used. In one embodiment, a different protocol, such as SNMP, is used, although other protocols may be used.

In general, it is desirable to obtain data directly from a hard copy output engine 14 because this does not require modification of the network software.

In one embodiment, the link 32 comprises an intranet. In one embodiment, the link 32 accommodates HTTP for data communication.

Providing usage and status information relative to the print clients 40, the print spoolers 46 and the individual hard copy output engines 14 can permit more effective and timely ordering of consumables and preventative maintenance for the hard copy output engines 14.

Fig. 3 is a simplified flowchart illustrating a process P1, in accordance with an embodiment of the present invention. The process P1 begins in a query task S1.

In the query task S1, the processor 15 determines if any consumables/maintenance items warrant further action. In one embodiment, one of the sensors 17 of Fig. 1 detects that an amount of a consumable commodity has fallen below a predetermined level.

In one embodiment, a "toner low" or "toner out" condition may be detected. In one embodiment, the hard copy output engine 14 may have multiple toner cartridges or other pigment supplies in order to be able to provide color images.

In one embodiment, the sensor 17 may detect that preventative maintenance needs to be scheduled. In one embodiment, the sensor 17 may determine that the hard copy output engine 14 is malfunctioning, and that an appointment for a service technician needs to be scheduled.

5 In one embodiment, the sensor 17 detects an event such as toner out, toner low, preventative maintenance alerts, including cleaning or replacement of component parts, consumables orders and low or "out of" status for other consumables or need for other maintenance items.

When the query task S1 fails to identify that any
10 consumables/maintenance items warrant further action, control passes to a step S2.

In the step S2, the processor 15 sets a timer to wait for a predetermined interval. When the processor determines that the predetermined interval has passed, the query task S1 is repeated.

15 When the query task S1 does identify any consumables/maintenance items warranting further action, control passes to a step S3.

In the step S3, the consumable/maintenance item that warrants attention is added to a notification list. Control then passes to a query task S4.

In the query task S4, the processor 15 polls others of the sensors 17
20 to determine if any other consumables/maintenance items are within threshold limits of requiring further action.

When the query task S4 determines that another of the sensors 17 indicates that another consumable/maintenance item is within threshold limits of requiring further action, control passes to a step S5.

25 In the step S5, the another consumable/maintenance item identified in the query task S4 as being within threshold limits of requiring further action is added to the notification list that was begun in the step S3. Control then passes back to the query task S4.

When the query task S4 determines that no further
30 consumable/maintenance items are within threshold limits, control passes to a step S6.

In the step S6, the notification list may be augmented with additional information. This information may include data allowing identification of the specific hard copy output engine 14 in which the conditions relating to the query task S1 were identified.

5 In the step S6, the notification list is incorporated into an electronic message, and the electronic message is transmitted. In one embodiment, the notification lists from several of the hard copy output engines 14 of Fig. 2 may be "pooled" or included together in a single electronic message to further reduce handling and shipping requirements for maintaining the hard copy output
10 engines 14 in good operable condition. In one embodiment, the electronic message is transmitted to a URL via the Internet. In one embodiment, the electronic message is transmitted as an email.

In one embodiment, a program such as Microsoft Outlook or Microsoft Exchange, both available from Microsoft of Redmond, Washington, may be used
15 to send electronic messages via email, for example. The operation of the Outlook email product from Microsoft (Redmond, WA) is described in U.S. Patent No. 6,125,369 filed on Oct. 27, 1997, entitled "Continuous object synchronization between object stores on different computers" and issued to Charles Wu and George Hu, and in U.S. Patent No. 6,073,137, filed on Oct. 31,
20 1997, entitled "Method for updating and displaying the hierarchy of a data store" and issued to Alon Brown, Scott Thurlow and Steven Wells, which patents are hereby incorporated herein by reference for their teachings.

The process P1 then ends.

In one embodiment, at least a portion of the process P1 is carried out via
25 the processor 15. In one embodiment, at least a portion of the process P1 is carried out via the computer 12. In one embodiment, at least a portion of the process P1 is carried out via a server or exchange server.

For example, in the query task S1, one of the sensors 17 may indicate that "CYAN TONER IS LOW." Then, during a first pass, the query
30 task S4 may determine that "MAGENTA TONER IS AT OR NEAR LOW THRESHOLD." This facilitates replacement of both the cyan toner cartridge and

the magenta toner cartridge via a single order, by noting that the next toner cartridge that is likely to fail is the magenta cartridge. This provides savings in labor in shipping the cartridges and in replacing the cartridges, and also reduces the amount of time that the hard copy output engine 14 is inoperable due to being serviced.

Additionally, in another iteration of the query task S4 prior to execution of the step S6, another one of the sensors 17 may provide an indication that the "FUSER IS AT OR NEAR LOW THRESHOLD." In this instance, the electronic message may include this information, providing additional labor and cost savings in filling the order, shipping the order and in the amount of time that one or more of the hard copy engines 14 is inoperable due to being serviced.

The protection sought is not to be limited to the disclosed embodiments, which are given by way of example only, but instead is to be limited only by the scope of the appended claims.